EMS Annual Meeting Abstracts
Vol. 11, EMS2014-331, 2014
14th EMS / 10th ECAC


# Investigation of balancing effects in long term renewable energy feed-in with respect to the transmission grid

Alexander Kies (1,2), Lüder von Bremen (1,2), Kabitri Nag (1), Elke Lorenz (1), Detlev Heinemann (1,2)

(1) Institute of Physics, Carl von Ossietzky University of Oldenburg, Germany (alexander.kies@uni-oldenburg.de), (2) Forwind-Center for Wind Energy Research, University of Oldenburg, Germany

An European power system mainly based on renewable sources will have dominant contributions from wind and solar power.
However, wind and solar generation facilities have due to the weather dependent nature of their resources highly fluctuating feed-in profiles. To overcome the mismatch between power consumption and generation it is important to
study and understand the generation patterns and balancing potentials.

High temporally and spatially resolved long term weather data was used to simulate the feed-in from several types of renewable energy sources such as wind, solar, hydro, wave, csp etc. aggregated on the country levels covering most of Europe for the years ranging from 2003 to 2012.
Power from wind and solar varies strongly on the daily and seasonal scale.
While wind feed-in tends to be high in winter and low in summer, solar feed-in behaves vice versa.
The same is true for the daily time scale: Solar feed-in is weak at night and strong during the day while the opposite is true for onshore wind at least in certain areas.
We analyze the interplay of different renewable sources as well as balancing by increased spatial scale and their effects on the transmission grids on different temporal scales.

The reduction of variability on different spatial scales and by combination of different renewable sources was investigated and will be presented. It is shown that the intelligent use of balancing reduces required transfer capacities and the mismatch between power generation and consumption to a large degree.
Furthermore, a simplified transmission grid model was used to study the influence of renewable feed-in on required inter-country grid extensions.

The work is part of the RESTORE 2050
project (BMU) that investigates the requirements for cross-country grid extensions, usage of storage technologies and capacities, the development of new balancing technologies and the conceptual design of the future energy market which is suitable for high shares of solar and wind.